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(ERIC)

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TITLE: " A STUDY OF THE EFFECTIVENESS OF USING EDUCATIVE TOYS IN TEACHING SCIENCE FOR PRIMARY STANDARDS OVER THE TRADITIONAL METHODS".

INTRODUCTION:-

(a) Need for the Study:-

One day while observing the practice teaching class the investigator observed that a student was playing with a toy and many of his friends rounded him up and all of them were enjoying with the toy. Even though the bell had gone they continued to play with the toy insted of coming to the class. The investigator thought that student are more interested in the toys them in class room learning, and also he went to them and closely watched them for a while. Wihtout the guidence either from teachers are from parents, students involved themselves in finding out the working principle of the toys apart from enjoying with the toys. Fortunately, that ~~[toys was working on the principle of that]~~ toy was working on the principle of center of gravity. It was an interesting toy too.

Students came to the investigator and they want to clarify their reasons for working of the toy. It was interesting to the investigator that student themselves came with a problem, and also many answer to it. Infact this was one of the objectives of science teachings. The investigator was very happy to share the feelings with them and solve the problem of the toy working by modilation many reasons given by the student themselves, from that day on wards the investigator encouraged the student to bring many toys available in the locality and analyse the principle behind them. It was a pleasent experience for the investigator to see that every day

Contd....2.

This made the investigator to think deeply about the method of teaching science for primary level. The investigator thought that if the toys are used while teaching science for primary standards, it can be made more meaningful and educative instead of traditional experimental methods. Because the toys themselves will inspire the students first, secondly it will arrest the interest of the students till the reason or reasons are known to them about the working of the toy. Thirdly, by using the toys of same nature or slightly different toys it was easy to evaluate the students.

Therefore, investigator thought that using educative toys in teaching science for primary standards may help the students, in developing good in-sight in solving a problem of their own choice.

Apart from this, the unique feature of this type of teaching has its own advantages namely, it will inspire the students, arrest the interest of the students through-out and also it can be used for evaluating them.

HYPOTHESIS:-

Science teaching through educative toys may not be as effective as traditional methods. Science teaching through educative toys may not increase the comprehension easily.

OPERATIONAL DEFINITIONS:

(1) Educative Toys- Such toys evolve some concepts which are included in primary science syllabus of Indian states.

(2) Toys- Means any play material available in the locality made out of cheap materials which are accepted by the students at once. It also means any interesting experiments, working models, figures, etc., which are self attractive to the student community.

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3. Primary standards means syllabus for Ist to VIIth grade prepared by N.C.E.R.T. New Delhi.
4. Traditional methods; means teaching with laboratory equipments or lecturing methods.

(F) LIMITATIONS:-

This will be tested only for primary Vth standard or Karnataka State syllabus, for one accademic year is 1979, to 1980.

(B) SIGNIFICANCE OF THE STUDY:

Investigator observed most of our Text Books in science are experimental oriented. Naturally teachers follow them mainly. It is also experience of the researcher that many of the teachers fail to inspire the students, before they stort the lesson. Unless they inspire the pupils educationally we may not get the expected learning out-come.

'Toys have become boon in inspirting the students quickly and when the principle included in its constitutents are explained, it will be easy to make them understand and also in its quite innovative at that stage.

Playing is a serious business, children at play are totally involved emotionally and intellectually and physically. The use of toys stimulates learning medium for children. The use of locally produced toys which enable children, to actively manipulate concentrate objects and materials in their envirolment, thus forming a solid foundation for development of more complex scientific concepts lateron.

For educational purposes, we can devide toys into following categories,(a) building toys, discovery toys,

Contd....4.

invention toys, design toys. Each type of toy offers different challanges to the students. That toys need not be expensive models but should be cheap and easly availably or it should be made out of low cost or not cost materials. Some of the ingenious toys that spring up during festivals, mandles, Exhibutions can be used in class room to make the teaching more meaningful and effective. It is also necessary to give encouragement to the students to make their own toys or to modify the existing toys thus making still more attractive. For this purpose, nature it self is a good store room. For example materials like rubber rings, balls, bombu, coconut, shells, plastic, bags, sticks leaves, ocean shells etc., are some of the example, now-a-days, easly available springs boxes, can be used as toys.

Therefore the investigator thought that encouraging students like this will not only make the student interesting in learning various conceptes of science but also make the teachers work easy and more meaningful apart from reducing the cost of equipments needed for building laboratory at primary level. Infact this is the challange posed to developing countries.

PROCEDURE:-

The investigator selected a primary school having two sections in Vth Standard and conducted pre-test to both the sections. And keeping one section as controlled, the other section was exposed to various toys. The whole year many toys are used while teaching science. But the controlled group was not exposed to these toys only traditonal teaching was carried out. By comparing the results after that year end, the investigator found that the percentage of passess comparitively were that is percentage than the controlled group.

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For collecting toys various methods are followed.

(1) Local shops are instead and suitable toys of collected.
(2) Correspondences are made to various toys firms to get the name design of the toys available with them.
(3) Teacher trainees pupil teachers) are encouraged to design toys and use them in teaching their practice teaching classes. The feed backs are collected from them.
(4) The experiments group students, are encouraged to collect locality available toys or create toys by using raw materials.
(5) The researcher will also collect various toys designs from experience teacher, books, magzine science, clubs, hobby centers, etc.,.

REVIEW OF RELATED LITERATURE:

The investigator found there is no "The Book" on teaching science through toys. But he got much information on these lines from various science books. Infact some of the books gave him a good insight to the problem. The books which give him the insight are given below.

		By:-
1.	Entertainment in Physics:	Ya. Perelman Russain - Author
2.	Ist, IInd, IIIrd, books of experiments.	Leonard De Vries.
3.	UNESCO-Hand-book	UNESCO -Publication.
4.	Rasayanika Chemathkara	Dr. S.P. Hare Kutt
5.	Science Teaching Hand-book	Prof. C.S. Rao.
6.	Environmental approach to science teaching	N.C.E.R.T. Publication.
7.	School Science Magazine	N.C.E.R.T. Publication
8.	Science today Magazine previous three years.	Times of India Publication.
9.	Teaching Science to the ordinary pupil	Laybourn & Bailey
10.	Research in education	John W. Best.

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DESIGN OF STUDY:

(a) Description of Research design:

The investigator selected an experimental design to test hypothesis. Two sections of Vth Standard in one of the local primary school was selected for experimentation. The selection of students each one of the sections was made by Random Technique.

The section (A) was taken as experimental group. The section(B) remained as controlled group. To minimise the "Extraneous" the variable one same teacher was requested to teach science subject for both the classes. Similar precaution were taken to minimise the effect of "Attribute Variables" like, age sex, social standard etc.,

But intervaining variables like curiosity in playing with the toys by a controlled group was minimised by exposing these toys to experimental group only, when the controlled group was engaged in other subjects. But it was admitted that ~~peoples~~ pupils of experimental group had exchange of those experience with toys with the friends of the controlled group. The investigator found it difficult to controlled these variable because both the sections were the same School.

During June 1979 the investigator gave four demonstration classes in teaching science through toys. Immediately investigator, collected the views both from teacher trainees, and teacher educators, it was found from the views express by them that teaching science through toys highly interesting and inspiring to the students, when compare to the traditional methods. It was also felt by the investigator during these lessons that the student an experimental group were learning more naturally and unknowingly with all Enthusiasm and zeal. Infact it was the problem for the investigator to controlled the students while playing with toys.

A list of important concepts mainly in physics, Chemistry and Biology were prepared. Among this concepts, a few concepts which can be

Contd......8.

taught through toys were listed out. It was an impossibility to find suitable toys to all the concepts in science.

The lessons to the experimental group were conducted on these phases.

(1) Suitable toys ~~was~~ were given to individual or group of students in the experimental group with an instruction to play, duration No. of group, were determined keeping in view the individual toys.

(2) Discussion:-

During these phase the teacher was requested to start discussion in such away that the whole class should participate in the discussion, pertaining to the working of the toys, the interesting aspect of the toy principle behind construction or working of the toy etc., In certain classes teacher trained to get suggestions in modifications, small alterations of toy construction.

(3) EVALUATION:-

Most of the toys can be used as a evaluation tool. At these stages different toys on the same concept can be used. The interesting point which the investigator found was that most of the students changed their attitude when they saw a toy or play with it even out side the class room.

(B) Sampling procedures:-

In this case no sampling was taken as the population was very small. This project was limited to experimental project rather than experimental research.

(C) Data-gathering Instruments:-

The main data gathering tools are as follows:-

1. Questionnaire
2. Observation
3. Pre-Test (Test)
4. Post-Test (Test)
5. School-Test Marks. (Test)

APPENDIX NO.

LIST OF STUDENTS IN CONTROLLED GROUP VTH STANDARD 'A' SECTION

Reg.No.	Name:	Reg.No.	Name:
1.	Girija E.	21.	Mohammed Siddik
2.			
2.	Geetha S.	22.	Mahesha M.S.
3.	Bharathi H.N.	23.	Rangaswamy C
4.	Meenakshi	24.	Ramesh H.S.
5.	Yashoda E	25.	Lokesha Babu M
6.	Rajamma	26.	Shanthakumar
7.	Renuka U.L.	27.	Shivanna K.P.
8.	Vijayakumari H.N.	28.	Shankar Kumara B.C.
9.	Vimala	29.	Shivaprakash H.N.
10.	Saroja	30.	Swamy H.S.
11.	Sujatha	31.	Syphulla
12.	Hemalatha	32.	Suhilpasha
13.	Annappa A	33.	Chandrakala R.
14.	Ananda R.	34.	Vijayakumar H.P.
15.	Krishnamurthy R	35.	Sujatha H.V.
16.	Channakeshava M.C.	36.	Venkatadasappa H.A.
17.	Dyave gowda	37.	Suma T.M.
18.	Prasad	38.	Manjula H.G.
19.	Basavaraju T.E.	39.	Nataraja
20.	Mohammed Rafik	40.	Sarojamma K.

Note:- Here after words only Register Nos. will be mentioned instead of names.

APPENDIX NO.

(LIST OF STUDENTS IN CONTROLLED GROUP V TH STANDARD 'B' SECTION)

Reg.No.	Name:
1.	Yashoda
2.	Gayathri B.
3.	Sukanya H.P.
4.	Kamala S
5.	Jayalakshmi
6.	Vijayakumari H.C.
7.	Vijaya K.M.
8.	Manjula D.
9.	Sharada
10.	Shobha T.
11.	Indirabai H.P.
12.	Lalithamma
13.	Harini H.R.
14.	Suma H.A.
15.	Bharathi D.
16.	Savithramma B.
17.	Ansar Pasha
18.	Ananda.A
19.	Eswhara
20.	Peetar
21.	Madhusudhan
22.	Mallikarjuna M.S.
23.	Manjunatha H.S.
24.	Rajashekhar H.R.
25.	Ramalingam B.
26.	Lokesha B.
27.	Jayakumar H.S.
28.	Keshavamurthy T.
29.	Ganesh H.E.
30.	Prakash C.
31.	Suresh A.
32.	Prakash S.
33.	Nagesh
34.	Shivakumar B.C.
35.	Nazimpasha
36.	Umesha
37.	Vijayalakshmi
38.	Nageshmurthy
39.	Abidha Begum
40.	Eraiah
41.	Indira Bai
42.	Rhafi
43.	Suma
44.	Shantha Kumar
45.	Lokesha Babu.

Note: Here after words only Register Nos. will be mentioned instead of names.

(D) STATISTICAL DETAILS:

'A' Section

Sl. No.	Ist Test	IInd Test Score Test
1.	40	70
2.	60	55
3.	50	56
4.	40	55
5.	40	45
6.	50	30
7.	40	52
8.	30	43
9.	35	70
10.	40	40
11.	35	55
12.	40	50
13.	40	43
14.	50	35
15.	35	45
16.	30	55
17.	30	20
18.	35	48
19.	35	50
20.	55	60
21.	55	70
22.	35	55
23.	30	40
24.	40	55
25.	55	33
26.	30	30
27.	20	50
28.	35	31
29.	45	54
30.	45	40
31.	55	40
32.	30	[illegible]
33.	30	55
34.	40	51
35.	40	49
36.	42	46

'B' Section

Sl. No.	Ist Test	IInd Test;
1.	35	45
2.	40	40
3.	35	26
4.	30	40
5.	35	35
6.	30	30
7.	45	45
8.	30	46
9.	40	40
10.	45	55
11.	30	41
12.	50	55
13.	35	30
14.	40	41
15.	40	46
16.	60	70
17.	45	35
18.	60	40
19.	40	55
20.	35	60
21.	50	30
22.	50	40
23.	30	35
24.	45	55
25.	40	30
26.	40	40
27.	30	28
28.	70	45
29.	45	45
30.	55	40
31.	55	50
32.	40	35
33.	45	45
34.	35	40
35.	55	40
36.	40	41
37.	45	42
38.	42	35

0=0=0=0=0=0

FREQUENCY;

A' Section Ist Test;

60-51	1111 11	7
50-41	1111 1	6
40-31	1111 1111 1111	15
30 80-21	1111 11	7
20-11	1	1

0=0=0=0=0=0=0=0=0=0=0=0=0=0=0=0=0=0

36

0=0=0=0=0=0=0=0=0=0=0=0=0=0=0=0=0=0

IInd Test:

70-61	111	3
60-51	1111 1111 11	12
50-41	1111 1111 11	12
40-31	1111	4
30-21	1	1
21-11	1	1

0=0=0=0=0=0=0=0=0=0=0=0=0=0=0=0

36 33

0=0=0=0=0=0=0=0=0=0=0=0=0=0=0=0

FREQUENCY:

'B' Section Ist Test:

60-51	111	3
50-41	1111 1111 YY	11
40-31	1111 1111 1111 111	18
30-21	1111 1	6
20-11	-	
		38

IInd Test:

70-61	1	1
60-51	111	4
50-41	1111 1111 111	15
40-31	1111 1111 1111	12
30-21	1111 1	6
20-11		
		38

CENTRAL TENDENCIES 'A' SECTION;

60-51	7	2	14	28
50-41	6	1	6	6
40-31	15	0	0	0
30-21	7	11	7	7
20-11	1	2	2	4

Mean 22.72
Medn; 46.16
Mode; 73.04

IInd Test;

70-61	5	2	10	20
60-51	12	1	12	12
50-41	12	0	0	0
40-31	5	1	5	5
30-21	1	2	2	4
20-11	1	3	3	9
				50

Mean; 42.44
Medn; 58.66
Mode; 61.1

CENTRAL TENDENCIES. 'B' SECTION:

60-51	3	2	4	12
50-41	11	1	11	11
40-31	16	0	0	0
30-21	6	1	6	9
20-11	0	2	2	4
				[illegible]

Mean: [illegible]
Median: 46.13
Mode: 74.72

' B' Section:...

70-61	1	2	2	4
60-51	4			4
50-41	15	0	0	0
40-31	12	1	12	12
30-21	6	2	12	24
20-11	28		16	44

Mean: 50.24
Median: 49.30
Mode: 51.72

0=0=0=0=0=0=0

CORRELATION;

'A SECTION Ist Test:-

				D	D2
1.	40	70	-	30	900
2.	60	55	-	5	25
3.	50	56	-	6	36
4.	40	65	-	25	625
5.	40	45	-	5	25
6.	50	50	-	0	0
7.	40	52	-	12	144
8.	45	55	-	10	100
9.	55	70	-	15	225
10.	40	40	0	0	0
11.	35	50	-	15	225
12.	40	50	-	10	100
13.	40	46	-	6	36
14.	50	55	-	5	25
15.	35	49	-	14	196
16	30	55	-	25	625
17.	40	30	+	10	100
18.	20	43	-	23	529
19.	35	60	-	25	625
20.	55	50	+	5	25
21.	55	70	-	15	225
22.	35	65	-	30	900
23.	30	40	-	10	100
24.	40	55	-	15	225
25.	55	35	+	20	400
26.	30	30	0	0	0
27.	20	60	-	40	1600
28.	35	51	-	16	256
29.	45	54	-	9	81
30.	40	40	+	5	25
31.	55	40	+	15	225
32.	30	50	-	20	400
33.	20	55	-	35	325
34.	40	51	-	11	121
35.	40	49	-	9	81
36.	42	46	-	4	16
	Grand Total				9459. (9434)

= -0.21

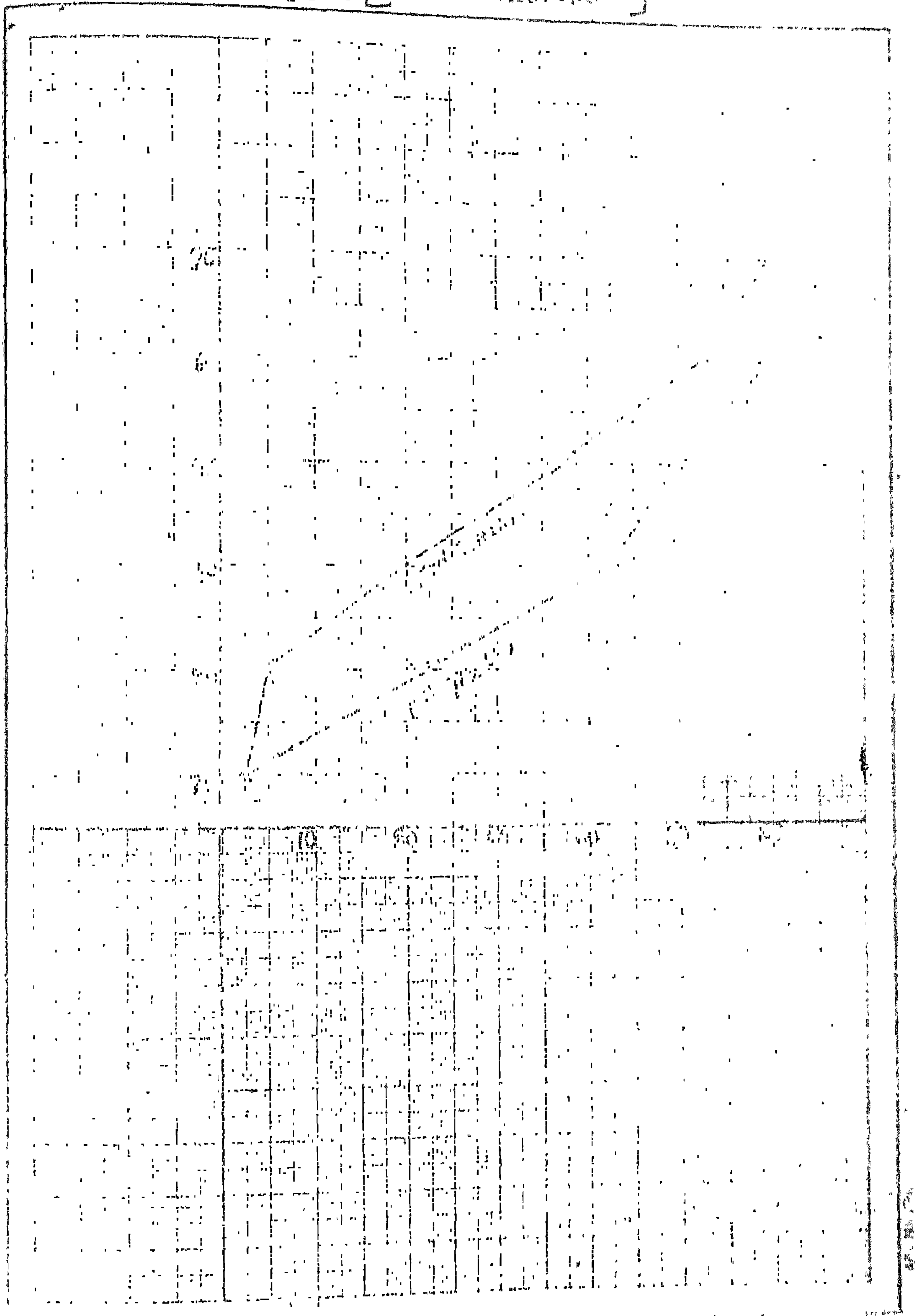
CORRELATION: 1ST SECTION;

Ist and IInd Test;

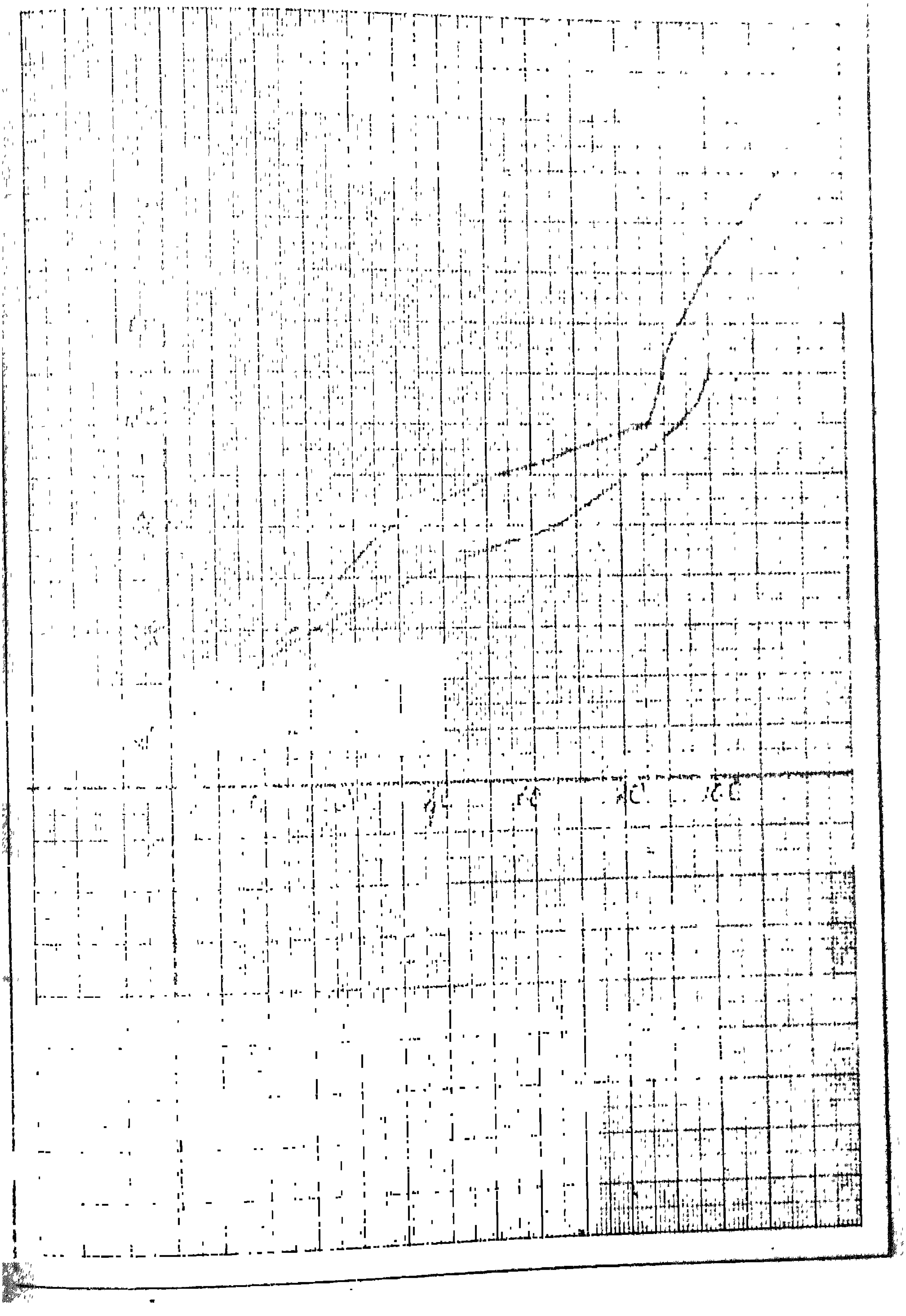
Sl.No.				d	d^2
1	35	45	-	10	100
2	40	40	0	0	0
3.	35	26	+	9	81
4	30	40	-	10	100
5	35	35	0	0	0
6	30	30	0	0	0
7	45	45	0	0	0
8	30	48	-	18	342
9	40	40	0	10	0
10	45	55	-	10	100
11	30	41	-	11	121
12	50	55	-	5	25
13	25	30	+	5	25
14	40	41	-	1	1
15	40	46	-	6	36
16	60	70	-	10	100
17	45	35	+	10	100
18	60	40	+	20	400
19	40	55	-	15	225
20	35	50	-	15	225
21	50	30	+	20	400
22	50	40	+	10	100
23	60	35	+	25	625
24	45	55	-	10	100
25	40	30	+	10	100
26	40	40	0	0	0
27	30	28	0	2	4
28	30	45	-	15	225
29	45	45	0	0	0
30	35	40	-	5	25
31	26	30	-	15	225
32	40	35	+	5	25
33	45	45	0	0	0
34	35	40	-	5	25
35	35	40	-	5	25
36	40	41	-	1	1
37	48	42	+	6	36
38	42	36	+	6	36
	Grand Total				3016/-

//Correlation: 0.57/-

A+A [EXPERIMENTAL [illegible]]



B+B C Cooler (Graph)



ANALYASIS OF DATA

PRE TEST & POST TEST:

The comparison of the pre-test and post test course reveals that in experimental group there is lot of improvement when compare to the scores of pre-test and post test of the controlled group. This necessarily reveals due to the fact that experimental group had the chance first hand experience of the concepts through toys, then the controlled group. Though the results of controlled group is not so poor number of first classes, and second classes are more in experimental group. The number of passes in both the group is almost same. This may due to the fact that the investigator is not able to provide toys experience to all the concepts in science.

COMPARISON OF GRAPHS:

The comparison of the graphs revelas that a steep praise in the curve 'A' group one compare to the curves of 'B' controlled group. In both the cases the curve has not come down indicating the less number of failures therefore, investigator came to the conclusion that using toys in teaching science, will improve the comprehension. By providing more and more such experiences the comprehension, retantivity will be more and longer this causing a good percentage of pupils to secure more marks.

CORRELATION OF SCORES:

The correlation Co-efficient of the test in 'A' group is negative because of thefact that the intervaining variable. But in cause of controlled group there is postive correlation because there is not such variables intervaining.

Therefore, the investigator feels that there may be enormous effect on students because of the experimental variable in section 'A' as it causes different impact of different magnitude on each students. More interesting point is that, an intelligent student can grasp more and quickly. Than the other students. Similarly the comprehension will vairy according to individual I.Q. but in case of controlled group this individuality has no relevance because of the fact that same method of traditional teaching is given to all the students. There is a little scope for an intelligent student to probe further. This is the main difference that the investigator found in the project. Though initially using toys in experimental groups consumed more time than traditional method, it was found that more quickand more easy to teach in later stages. In fact in certain comprehanded, the concept in science as individual thinking played animportant role in experimental group, but it is mostly absent or far less incase of controlled group.

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A close observation of the test marks also reveals that gradual improvement in percentage of passes in experimental groups.

It was found by the investigator a marked changed in the appititudes of the students with respect to Science aspects as many of the pupils were involved in collections of toys, magzines, containing entertaining experiments etc.,

A final test in science which cortains questions other than the Vth standard Test but of same level faced well by all the students in the experimental group but not so much well done in case of controlled group.

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SUMMARY AND CONCLUSION:

The test course of pre-test, post test, the other general test of the school are compared and found that experimental group achieved more percentage than the controlled group. Apart from this achievements the investigator found that a marked differents in attitude in learning science among experimental groups students then controlled group students. The very interesting point the investigator like to mention is that after teacher using toys in the class room pupils a type of a close attachment, free rapport was developed between the teacher and pupils. This was totally absents in case of controlled group. A type of curtain was found in between teacher and students in controlled group. Students of experimental group came with their own toys, working models, to the class room even though it was not assigned to them. This made to reveal to the investigator that a type of change in attitude was easily found in experimental group which the investigator or any educational experts attaches more importance. Many of the students gave lot of thinking in there daily experiences while plying with toys. The power of observation was showed marked improvement. This was found by the investigator when the pupils used to come to the class with a group of students in solving or finding out the reason behind the working principle of a toy.

The investigator thus found ~~this~~ that students of experimental groups showed more interest, zeal even in the seventh and eight periods. Similarly when they are told orwhen they know that there is science class in the first period they used to come early wit out any troubles. But this was not the in case of controlled group.

The investigator found that the toys happens to be a boon in the hands of a teacher because it inspires (~~this~~) students very easily at the begining of the class. Not only arousing interest in the class at the begining of the lessons but also the interest was retained through out

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the period or until the concepts are understood. Similarly the toys were very helpful in developing the lessons. In fact, the time spent during teaching was almost like spending time in Cinema, or in entertaining events. Therefore students used to learn the concepts while plying- un-knowingly they used to reach objective of the teacher.

It is also an interesting point to notice that toys are very useful in evaluating the students. The evaluation in this methods cannot be subjective in nature but it will be definately a objective one. It is because wrong conclusion will need a lot of discussion in the class room.

The investigator, therefore, found that using toys in place of traditional method of teaching will help class room teacher in "Introduction stage", " Developing stage" and also "Evaluation Stage". This unique value was ~~found~~ experienced by the investigator through out the project.

Thought using toys by students seems to consume more time at the begining then the traditional method but it will be very quick., more comprehensive and self involving method after several periods. This was not true in the case of controlled group. Here teacher task mainly to select a suitable toy to each concepts but they other task will be of the student thus it reduces considerably teachers task in the class room.

Therefore the investigator came to the conclusion will help "effective use of toys will help this students understanding, thinking comprehending a concepts apart from improving many skills involidinate in understanding the principle behind the constuction of the toy".

RESTATEMENT OF THE PROBLEM

Science teaching through suitable educative toys will help more in understadding comprehending and improving skills then traditional science teaching methods.".

DIFFICULTIES EXPERIENCE IN THE PROJECT:

Investigator found it very difficult to collect toys for all the methods. Most of the concepts in biology had poor scope for such toys. physics and Chemistry either will have entertaining events or toys of scientific value. Even here it was found difficult to find toys to all concepts. The other experienced of the investigator was that a few classes of using toys followed with a class of traditional methods without using a toy created several problems. During initial stages teachers found it difficult to use toys in teaching experience as it is a very new type of teaching. Similary toys having different principles behind their construction, some time led the students into difficulty. No books are available on topic wise or concept wise listing of toys in the market. Nearly twenty to thirty books were consulted to select several toys. preservation of toys in the class and also different types of toy as many of the students want to play with it often. Only because of this, investigator lost many toys. It was very difficult for the investigator to protect control group students in not using the toys because students used to share the experience out side the class room. This was the same case with other students & other than experimental and controlled group.

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RECOMMENDATIONS FOR FURTHER INVESTIGATION:

The investigator felt lot of scope for a detailed research on these lines. And also found that certain standard and cheap toys can be used in regular class rooms. These toys can find a place in the text books, in the laboratories of each school. Text books in science should include photographs of certain important toys or improvised entertaining experiments in appropriate places in the text books. A toy research center at every D.S.E.R.T. and N.C.E.R.T. will help in a long way in guiding teachers, orienting, teachers, bringing modified toys, giving designs or new toys of low cost etc., Investigator desires to bring out a guide book and toys particularly are scientific value available in different parts of India and if possible toys can be increased only involving students on those lines. Therefore as suggested earliear a consolidated hand book on toys with the following heading will help both teachers, parents, and students, (The book should have the following head lines). 1. Name of the toy, with photograph, 2. Science principle involved in the toys construction 3. Scope for improvisation 4. Different concepts involved 5. Probable cost of the toy 6. Address of the dealer 7. Appendix. The investigator is already attempting this type of books (only for science). Since it involves atleast Rs.30,000/- Rupees thirty thousand to Rs.40,000/- Rupees forty thousand the investigator request help from N.C.E.R.T. and D.S.E.R.T. The investigator hopes to survey different types of toys in different regions of our country. The problem of securing toys to all concepts should be listed out just to help the class room teacher. The costly toys, the toy dealers making profit should be avoided. Local papers, weekly magazine, educational publication should find a place in making familiarise different types of toys available in the region.

BIBLIOGRAPHY:

1.	Physics for Entertainment Volume 1	By:- Ya. Perelman
2.	Physics for Entertainment Volume 2	
3.	107 Stories about Chemistry	I.Vlasov and D. Trifonov
4.	The first book of experiments	Bernard de Vries Translated by Eric G. Breeze
5.	The second book of experiments	
6.	The third book of experiments	
7.	Physics experiments for children	By. Dover publications Inc. New York.
8.	Electricity experiments for children	
9.	Chemistry experiments for children	
10.	Science puzzles	Anthony Ravielli
11.	Rasayanika chamthkara	Dr. S.T. Hire Mutt
12.	UNESCO-Hand Book	UNESCO publication
13.	101 experiments in Science	
14.	N.C.E.R.T. School Science Magzine	N.C.E.R.T. publication
15.	Science Teaching hand book	Dr. [illegible] Rao.
16.	Research in education	By:- John W. Best
17.	Educational Statistics	Garrett
18.	Fundamental Statistics in psychology and Education	By:- J.P. Guilford
19.	Science to-day Magzine previous three years.	Times of India publication
20.	Science reporter	CSIR-publication.

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List of Toys in the experimental group:

Sl. No.	Name of the toy:	Concept for which toys	Price:	Remarks:
1	2	3	4	5
1.	Singing, Balloon	Newtons third law motion	0.10	Students Collections.
2.	Climbing balloon	-"-	0.50	From Investigator.
3.	Magic ball	Heavy atmosphere pressure	1.00	Investigator
4.	Paper fan	Air as energy	-	Students.
5.	Magic, Rubber, Sucking, hangers	Air excerts alround pressure.	1.00	Investigator.
6.	Magic cup	Air exerts upward pressure	0.11	Students.
7.	Parachutte (Plastic with weight	Air exerts upward pressure	0.20	Students
8.	Cardboards snake	Convection current	-	Investigator
9.	Self fountaine	Compressed Air can do work.	0.20	Investigator
10.	Water Gun (Balloon with water	Liquids, Transmit, pressure, through-out.	0.10	Students.
11.	Tantalus cup.	Liquid find its level	2.00	Investigator
12.	Balancing toy	Center of gravity	2.00	Investigator
13.	-"-	-"-	-"-	Investigator.
14.	Spining disk	persistence of vision	-nil-	Student
15.	Reinbow wonder,	reflection of light	-nil-	Investigator
16.	Dolls Dance by electricity	Statistic current	-nil-	Investigator.
17.	parro in the cage	Persistence of vision.	-nil-	Investigator.
18.	Magic wheel	Change of energy K.P. to P.F.	1.00	Investigator.
19.	Self made phone.	Sound travells	0.20	Solids
20.	Water weighing machine Pascall's Law	Pascal's Law	2.00	Investigator.

Contd..2.

1	2	3	4	5
21.	Ciggarette Pack Microscope	Magnifying power	-nil-	Investigator.
22.	Match Box Microscope	-"-	-nil-	Investigator.
23.	[illegible] burning	(Oxidising property	-nil-	Investigator.
24.	Kites(Air pressure 13)	Air pressure	1.00	Students.
25.	Platic bag Aquarim		-nil	Investigator.
26.	Air gun		1.00	Investigator.
27.	Den/stist bottle	Demonstrate of different	-nil-	Investigator.
28.	Soap Bubble experiments	Surgace -"-	-nil	[illegible] to
29.	Soap bubble experiments	-"-	-nil-	Investigator.
30.	Hussain Toy (Drinking - bird.	Evaporation and center or gravity	12.00	Investigator
31.	Water Barometer	Measuring Air pressure.	0.30	Investigator.
32.	Blowing the bal from the funnel)	Burnollis principles	1.00	Investigator.
33.	String instruments made out of cocunt Cell	Propagation of sound	0.25	Investigator.
34.	Investigator ink.	Chemical action	0.20	Investigator.
35.	Sugar cun burning	Oxidation	0.10	Investigator.
36.	Chemical Dosier	Chemical reaction	33.00	Investigator.
37.	Colour wheel	White light consist 7 colours	2.00	Students. ~~Investigator.~~
38.	Music ~~xxxxxxxxxxx~~ bulle	Musical Note formation	0.80	Investigator.
39.	Music wood	Musical note formation	0.50	Investigator.
40.	Smoking rod	Chemical reaction	0.50	students.
41.	Shadow clock	Light travells St. Line.	0.50	Investigator.

1	2	3	4	5
42.	Plastic bag Fish keeping	Fish preservings	0.15	Investigator
43.	Central petal Magic drying	Observation Centeral petalfence	0.50	Investigator.
44.	Plastic fish, lizard etc.,	for observation	2.00	Students
45.	Glass cutting, by Electrical method and third method	Bad Conduct an of heat	0.20	Investigator.
46.	Bamboo and arrow	potential energy	0.80	Investigator.
47.	Dissolving sugar in full capacity cup without poring out.	Molecular space	0.50	Investigator.
48.	Plasticity ball	Plastic property	0.50	Investigator.
9.	Plastic bag filtering	Filteration	0. 0	Investigator.
50.	Quick Rainbow	White light Seven colours	0.10	Students.
51.	Marbles	Transfer of energy inertia Molecular space	0.50	Students.
52.	Boiling vessel	poor conduction of heat	-nil-	Investigator
53.	Automatic fire (Phosphorus glow)	Evaporating temparature	1.00	Investigator
54.	Self lighting candle	Evaporating temparature	0.50	Investigator.
55.	Disappearing beaker	Refractive index	0.50	Investigator.
56.	Friendly fire Currency note Burning)	Different in Evaporation tempr-ature.	1.00	Investigator
57.	Obedient egg	Diffence and Density.	0.50	Investigator
58.	Self moving balls	Chemical reaction	1.00	Investigator.
59.	Self flying Aeroplanes Plastic model & Paper-model.	~~Chemical~~ Aeroplane flying.	2.00	Investigator.
60.	Helicaptor Model .	Helicaptor working Upward Air pressure	5.00	Investigator.

Contd.. ....

1	2	[illegible]	4	5
61.	Music instruments set five (Sandy (dole)	Different vibration	2.00	Investigator.
62.	Transfer of Electrical energy into machanical	Transfery of energy	2.00	Invesigator.
63.	~~Transfer of Electrical energy~~ Water gun	Compressed water has energy	2.00	Investigator.
64.	Plastic Top, Wooden Tops	Earth rotation has Principle.	2.00	Investigator.
65	Persistence of vission operators	persistence of vission	-2.00	Investigator.
66.	Fish in the pond	persistence of vission	-nil-	Investigator
67.	Balloon balance	Air has weight ~~[illegible]~~,	0.20	Students.
68.	Chemistry Dynamo Kit experiments.	Twenty experiments in basic chemistry	15.00	~~Investigator~~ Dynam
69.	Physics Dynamo kit experiments	Twenty five basic experiments in physics	15.00	Investigator
70.	Smoke Prints	preservation of leaves	0.50	Investigator
71.	Plastasione models	Formation of different model	3.00	Investigator
72.	Water pressure, measuring clock.	Difference in pressure at different depth	2.00	Investigator
73.	Deepawali Crackers	Newtons third law motion and other Twenty different principle Chemistry and physics.	10.00	Investigator.
74.	Rocket models	Newton third law motion.	2.00	Investigator.
75.	camphor boat	Solid state converting into gas	0.10	Investigator.

Note:- Out of 150 Toys collected only 75 important toys/entertaining experiments are listed above.)

No.